

Invertebrates Transported to the Strait of Georgia and Juan de Fuca Strait by Ballast Water: Where Do They Come From and Where Do They Go?

Colin Levings¹, Jeff Cordell², Max Larson³, Mike Foreman⁴, Stacey Ong¹, Beth Piercey¹ and Mike Tarbotton³

¹ Fisheries and Oceans, Science Branch, West Vancouver Laboratory, West Vancouver, BC

² School of Aquatic and Fishery Sciences, University of Washington, Seattle, USA

³ Triton Consultants, Vancouver BC

⁴ Fisheries and Oceans, Science Branch, Institute of Ocean Sciences, Sidney, BC.

Abstract

In a project assessing the colonization risk of non-indigenous species (NIS) in ballast water organisms, the originating locations and identity of flora and fauna being brought into the Strait of Georgia were determined using indirect and direct methods. A database provided by the Vancouver Port Authority (VPA) from 515 ships enabled us to plot the start and end positions where ballast water exchanges took place in the north Pacific Ocean. The lines joining the start and end positions, which were called exchange transects, were on average about 400km long, and were located in diverse water masses of the north Pacific. We also investigated changes in invertebrate assemblages before and after mid-ocean exchange. Invertebrate communities were different before and after exchange but because the exchange process was relatively inefficient for some taxa, a few coastal organisms were likely always present after ballast tanks were flushed. We also obtained data from biological samples obtained from ballast tanks aboard ships in Vancouver Harbour. In samples with low salinity (<25 psu), 13 different taxa were found but the non-indigenous calanoid copepod *Sinocalanus* spp was dominant. Fifty-two taxa were found in high salinity samples (>25 psu). Particle-tracking techniques were used to simulate representative trajectories of passive and active ballast water organisms discharged at proposed back up deballasting sites in Juan de Fuca Strait. Under normal conditions, organisms move southward (summer) or northward (winter) in the Shelf Break Current and only under strong eastward or northward winds are they transported to the Washington or Vancouver Island shorelines.

References

- Larson, M., Foreman, M.G.G., Levings, C.D., and M.R. Tarbotton, 2003. Dispersion of discharged ship ballast water in Vancouver harbour, Juan de Fuca Strait, and offshore of the Washington coast. J Environmental Engineering and Science (in press)
- Cordell, J.R., Levings, C.D., Herwig, R.P., Ong, S., Piercey, G.E. and J.C. Perrins, 2003. The origin and consequences of zooplankton arriving in Vancouver, Canada and Puget Sound, U.S.A. Abstract of poster presentation at Third International Conference on Marine Bioinvasions, March 16-19 2003. Scripps Institution of Oceanography, La Jolla, California.

Acknowledgements

This research was supported by the Environmental Sciences Strategic Research Fund of the Department of Fisheries and Oceans, Canada. We are grateful to the Vancouver Port Authority and the owners of MS Skaugran for their cooperation and assistance.